

REMARKS/ARGUMENTS

First, Applicants note that claims 56-61 have been canceled from this application. This is done without prejudice to Applicants' right to continue to seek protection for them in other applications.

Secondly, for clarification, all claims remaining in the case have been amended to explicitly state that the number of imprinting groups referred to is the number of imprinted groups per imprint site, organized in a non-random pattern, not groups per overall substrate surface. The reference to groups per imprinted site was what was intended to be indicated by the inclusion, in the last amendment, of the term "organized in a non-random pattern", that is, organized in such a pattern with respect to each other.

The reference to imprinted functional groups per imprint site is supported in the specification, for example at page 4, seventh line of paragraph [0006].

Claims 1-9, 11, 12, 16, 17, 20-22, 34, 35, 40, 42, 62, 63, 65-67, 70 and 72 stand rejected as anticipated by Katz and claims 10, 13-15 and 64 as being obvious over this reference. In making these rejections the examiner refers to Figure 1 of the reference and considers Katz as disclosing imprinting multiple groups with thermal deprotection. The examiner finds support for this position in the disclosure in Katz that the more imprint groups per molecule, the higher the temperature required for deprotection of the imprinted groups.

However, this characterization of the reference disclosure is incorrect. With respect to the process claims herein, Katz discloses chemical, not thermal, deprotection. The Katz technique is discussed in the specification on pages 2-4, paragraphs 4 and 5, and is not the technique claimed herein.

As specifically stated in Katz, p. 286, left-hand column, the imprinting was done with molecules comprising benzene rings substituted by one, two and three protected 3-aminopropyltriethoxysilane groups. Deprotection was accomplished chemically by cleavage of C-N bonds by reaction with trimethylsilyl iodide. The resulting trimethylsilyl carbonate was exposed to water and methanol to liberate the imprinted propylamine sites.

All of this involves imprinting with a chemically removable protecting group, not a thermally labile group, and deprotecting using chemical, not thermal, means. Thermal deprotection, or thermolysis, as in the inventive processes, involves removal of the protecting group by heat or other non-chemical means, and is a unimolecular process (only a single molecule - the imprinting agent - is involved). The chemical deprotection process of Katz is a bimolecular process, involving two molecules - the imprinting molecule and trimethylsilyl iodide. The two processes are thus radically different. The fact that a higher temperature was used for deprotection in Katz when the imprinting molecule had three, as opposed to one, imprinting groups, simply means that more driving force was necessary to carry out that deprotection step as opposed to the others, and not that it was a thermal deprotection. However, as discussed below, notwithstanding the increased temperature used with the trisubstituted imprinting molecule the results produced were significantly poorer than with molecules having one and two imprinting groups of the same type.

The examiner commented that those skilled in the art would have found it obvious to move from three protecting groups to four and to find the optimum temperature for deprotection.

In response, Applicants submit that those skilled in the art would not have found it obvious to produce the Katz imprinting molecule with four such imprinting groups. Katz itself states that even with increased temperature it was much more difficult to remove three imprinting groups than one. As stated in the left-hand column of page 287, with one or two imprinting groups in the molecule, imprint removal (chemically) was 73%, but with three such groups the removal was only 22%, even with a temperature increase.

As stated in the specification, paragraph [0005], discussing the Katz publication, with the chemical deprotection already low for an imprinting agent having three functional groups, those skilled in the art would have expected deprotection of four such groups to be extremely unlikely to occur and therefore would not have sought to carry out deprotection of four groups with this technique at all.

In addition, even if those skilled in the art were able to find the optimal temperature for such an unlikely process, that process would still be a chemical - and not thermal - deprotection.

Katz therefore neither anticipates nor renders obvious process claims 1-17 and 20-22, all of which require a thermally labile protecting agent and thermal deprotection as opposed to a chemically removable group and chemical deprotection.

Respecting claims 34, 35, 40 and 42, each claim requires four imprinted moieties per imprint site and Katz discloses a maximum of three. The disclosure of Katz is limited to a single type of imprint molecule, and it can readily be seen that those skilled in the art would not seek to use a tetra-substituted molecule of this type in the Katz process, for the reasons just mentioned. From that reference, it also would not have been obvious to produce a product having four imprinted groups per imprint site as called for in claims 34 and 62, and claims dependent on them.

Applicants submit that the rejection of claims as anticipated by or obvious over Katz is not supported by the reference and should be withdrawn.

Claims 34, 35, 38-40, 42, 62-70 and 72 are rejected as anticipated by Davis et al.

Davis et al., like Katz, involves chemical deprotection, not thermal deprotection, and does not disclose the use of any thermally labile protecting groups. Figures 13 and 15, relied on by the examiner, disclose chemical deprotection (see Fig. 13: "extraction" step). There is no disclosure of imprinting agents having thermally labile protecting groups and no disclosure of any thermal deprotection.

Again, product claims 34, 35, 38-40 and 42 require four functional groups per imprint site, which is neither disclosed in Davis et al. nor obvious from it. No methodology is shown in that reference that would make such a product.

Applicants respectfully request withdrawal of the rejection of claims as anticipated by Davis et al.

Claims 1, 2, 4-9, 11, 12, 17, 20, 34-37, 39, 40, 62, 63, 65-67, 69, 70 and 72 stand rejected as anticipated by Ki et al.

Ki et al. is discussed in the specification of this Application at p. 11, paragraph 36. With respect to the process claims 1, 2, 4-9, 11, 12, 17, and 20, Ki et al. used an imprinting compound with only a single functional moiety whereas the aforesaid process claims call for use of an imprinting compound having a plurality of functional moieties, and/or the production of a product having a plurality of imprinted functional groups at an imprint site. With respect to claims 2, 34-37, 39, and 40, Ki et al. produce a silica having only a single imprinted moiety per imprinting site. However, the claims herein call for a product having a plurality of imprinted groups per site, organized in a non-random pattern with respect to each other. This is neither shown in Ki et al. nor obvious from that reference.

The examiner stated that Figures 3 and 4 of Ki et al. show the use of more than one functional group. However, that is not correct. Figure 3 of Ki et al. shows that one functional group is obtained, which may be either of two types, depending on the reagent used to extract the template molecule. Figure 4 likewise shows two alternate routes, not any production of two imprinted moieties.

Applicants respectfully request the withdrawal of the rejection of claims over Ki et al.

Claims 18, 19, 23-27, 30-33, 41, and 43-55 stand rejected as obvious over Katz in view of Dai II.

Katz is discussed above, and Applicants repeat that it discloses chemical - not thermal - deprotection, does not disclose thermally labile protecting groups, discloses a maximum of three imprinted groups per imprint site and does not render obvious how to achieve four groups per site, organized in a non-random manner. Dai II et al. does not make up for any of these deficiencies. Dai et al. II conducts deprotection using acid (col. 8 lines 34-37), and does not incorporate thermally labile protecting groups. This combination thus does not render the process claims 18, 19, 23-27 and 30-33 obvious.

With respect to claim 41, Applicants again point out that neither Katz nor Dai et al. disclose substrates imprinted with four functional groups per imprint site, organized in a non-random manner with respect to each other.

With respect to claims 43-55, the examiner asserts that Dai II disclose the use of different imprinting groups, referring to column 6 lines 49-64. However, this text does not disclose the use of different multiple imprints at a particular imprint site, but the use of a series of different sorbents tailored for different metals in individual filter cartridges. At column 9 line 27, Dai et al. begins a list of ligands that can be incorporated into their products. Each ligand is listed as a separate item; there are no combinations of ligands mentioned and no indication that any should be used in combination. The objective of this reference is the production of sorbents specific for certain metallic ions. Katz and Dai et al. II both use imprint molecules containing only one type of functional group to be imprinted (internal hetero atoms of various Dai et al. II imprinting molecules are not functional groups and are not imprinted in the final products). Claims 43 - 55, all of which require at least two different organized functional groups per imprint site, are not obvious over this combination of references.

Applicants respectfully request that the rejection of claims as obvious over Katz in view of Dai II et al. be withdrawn.

Claims 62-63, 65-67, 70, 72 and 73 stand rejected as anticipated by Dai et al. I. the examiner refers to p. 1236, left hand column and Figure 2. The examiner considers that figure to show imprinting with four groups because the figure shows that each of the two imprints contains two nitrogen atoms. However, that is not a correct interpretation of the figure. Only the terminal amino group of each imprinted moiety is a functional group; the intermediate nitrogen atom is not a functional group but only a part of the link to the substrate. Dai et al. I does not show any product with four imprinted functional groups per imprint site, organized in a non-random pattern, and does not render it obvious to produce, or how to produce, such a product.

Claims 62-63, 65-67 and 69-73 stand rejected as anticipated by Dai et al. II. These claims all require four or more functional moieties per imprint site, organized in a non-random manner with respect to each other. As stated above, Dai et al II do not disclose any product with four or more imprinted functional groups per site. The examiner's reliance on the Figures is misplaced, as the internal nitrogen atoms of the imprinting molecules are not functional groups and do not remain in the final product.

Claims 62, 63, 65, 66, 70 and 72 stand rejected as anticipated by Markowitz et al. the examiner refers to column 11, line 62 - column 12 line 9.

However nowhere do Markowitz et al. disclose a product having four imprinted functional groups per imprint site, imprinted in an organized non-random pattern, or how to obtain such a product. The portion of the patent cited by the examiner does not show the use of any imprinting agents having multiple imprinting groups.

In fact, Markowitz et al. disclose only the use of imprinting agents having a single imprinting group per molecule. The imprinting agent is described at col. 4 lines 37-39 as "a surfactant compound having a headgroup, wherein the headgroup comprises a group to be molecularly imprinted..." (emphasis added). The specification refers to "the imprint group" (col. 6 lines 14, 28, and 50). The two imprinting compounds described in columns 9 -10 have a single imprint group apiece. The imprint compounds at column 1 line 62 - column 12 line 9 likewise have one imprint group per molecule. Markowitz et al. produce products having pores or voids corresponding to the shape of the surface topography of the supramolecular structure of the imprinting molecule (col. 5 lines 12-52). Functional groups can be added later, if desired, but the reference discloses adding only one functional group per imprint site.

Withdrawal of the rejection of claims over all of the above cited references is in order, and is respectfully requested.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 415-576-0200.

Respectfully submitted,

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